Multiplication methods

	H	T	O
	1	8	7
×			9

Long multiplication (column)

×	100	80	7
9			

Grid method

	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
	1	8	7
+	1	8	7

Repeated addition

Less effective method especially for bigger multiplication

Multiplication with decimals

Perform multiplications as integers

e.g. 0.2 x 0.3 → 2 x 3

Make **adjustments** to your answer to match the question: 0.2 x 10 = 2

0.3 x 10 = 3

Therefore 6 ÷ 100 = 0.6

Estimations: Using estimations allows a 'check' if your answer is reasonable

Division methods

3584 ÷ 7 = 512

Short division

$$7 \overline{)\,3\,{}^{3}5\,8\,{}^{1}4} \quad 5\ 1\ 2$$

Complex division

÷ 24 = ÷ 6 ÷ 4

Break up the divisor using factors

Division with decimals

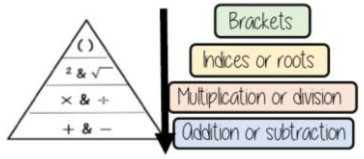
The placeholder in division methods is essential – the decimal lines up on the dividend and the quotient

24 ÷ 0.02 → 24 ÷ 0.2 → 240 ÷ 2

All give the same solution as represent the same proportion.

Multiply the values in proportion until the divisor becomes an integer

Order of operations



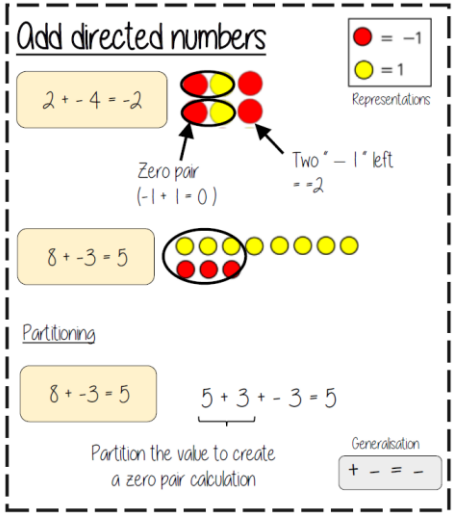
If you have multiple operations from the same tier work from left to right

e.g. 10 – 3 + 5 → 10 - 3 → 7 + 5

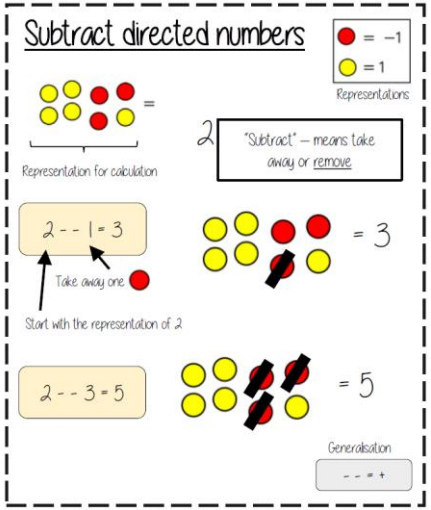
6 x 4 + 8 x 2

24 + 16 = 40

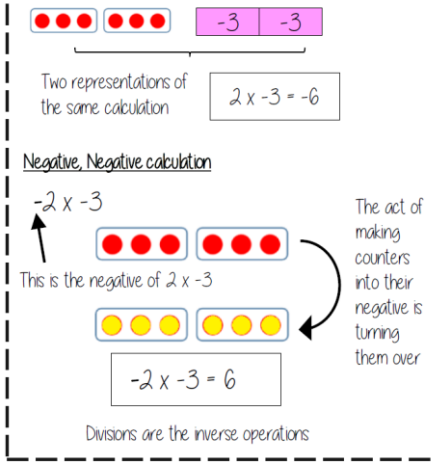
Add directed numbers



Subtract directed numbers

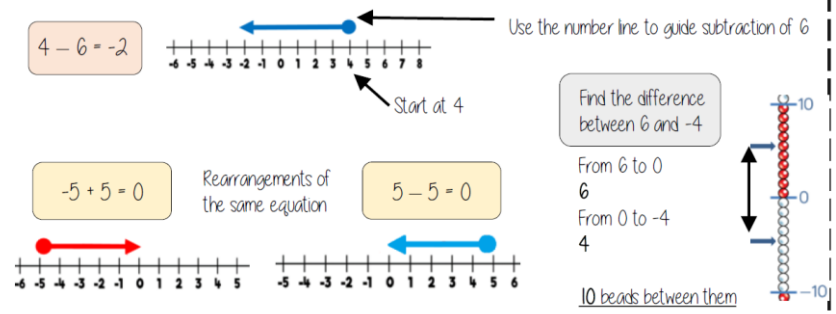


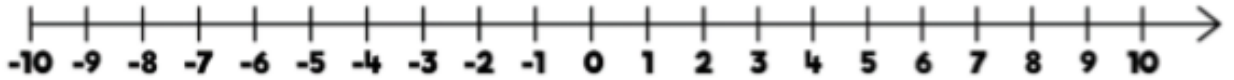
Multiply/ Divide directed numbers



Perform calculations that cross zero

Number lines are useful to help you visualise the calculation crossing 0





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Addition/ Subtraction laws for indices

$3^5 \times 3^2 = (3 \times 3 \times 3 \times 3 \times 3) \times (3 \times 3) \rightarrow 3^7$

The base number is all the same so the terms can be simplified

Addition law for indices

$a^m \times a^n = a^{m+n}$

$3^5 \div 3^2 \rightarrow 3^3$

$\frac{3 \times 3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}} \rightarrow \frac{3^3}{3^0} \rightarrow \frac{3^3}{1}$

Subtraction law for indices

$a^m \div a^n = a^{m-n}$

Multiplication law of indices

$(3^2)^3 \rightarrow 3^6$

$= 3^2 \times 3^2 \times 3^2$

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Multiplication law for indices

$(a^m)^n = a^{m \times n}$

Positive powers of 10

1 billion – 1 000 000 000

$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^9$

Addition rule for indices $10^a \times 10^b = 10^{a+b}$

Subtraction rule for indices $10^a \div 10^b = 10^{a-b}$

Standard form with numbers > 1

Any number between 1 and less than 10 → $A \times 10^n$ ← Any integer

Example

3.2×10^4

$= 3.2 \times 10 \times 10 \times 10 \times 10$

$= 32000$

Non-example

0.8×10^4

$5.3 \times 10^{0.7}$

Standard form with numbers < 1

Any number between 1 and less than 10 → $A \times 10^n$ ← Any integer

Example

3.2×10^{-4}

$= 0.00032$

Non -example

0.8×10^{-4}

$5.4 \times 10^{-4.2}$